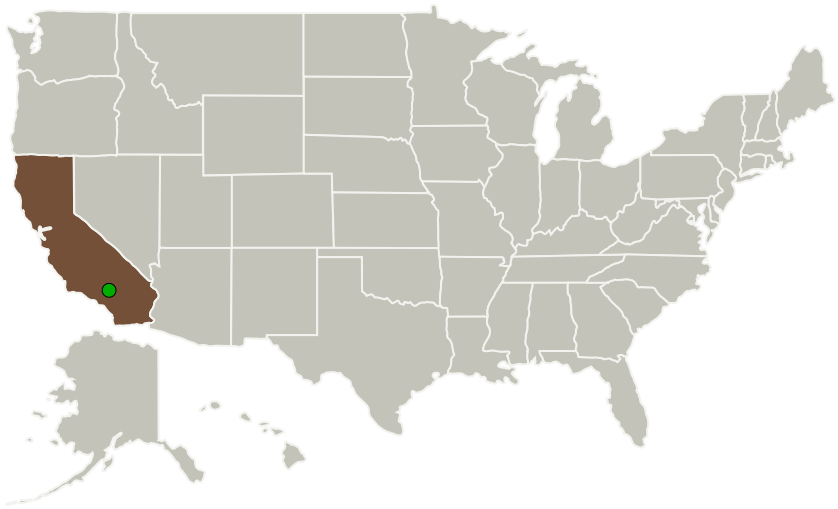
Onboard Model Checking for Small Scale Unmanned Aerial Vehicle Autopilots, Phase I

Completed Technology Project (2015 - 2015)

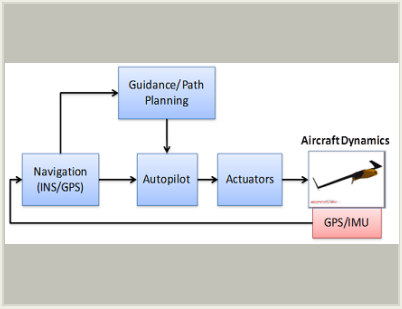
Project Introduction

Optimal Synthesis Inc. proposes to develop a formal verification and validation approach to small-scale Unmanned Aerial Vehicle (UAV) autopilots. The UAV autopilots are modeled as hybrid systems and further abstracted into a finite state machine to which a computational model checking tool is applied to verify the safety property of the autopilot. The abstraction is performed by rechability computation. While traditional reachability computation has been limited to low-dimensional systems, the abstraction approach developed by Purduer University approximates the hybrid system and exhibit significant improvement in computational efficiency. This forms the basis for onboard model-checking for safety. The proof of concept is planned to be demonstrated in the Phase I using simulation studies, and ensuring hardware-in-the-loop simulation and flight demonstration are planned in the Phase II research.

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Optimal Synthesis, Inc.	Lead Organization	Industry Small Disadvantaged Business (SDB)	Los Altos, California
Armstrong Flight Research Center(AFRC)	Supporting Organization	NASA Center	Edwards, California



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Completed Technology Project (2015 - 2015)

Primary U.S. Work Locations

California

Project Transitions

June 2015: Project Start

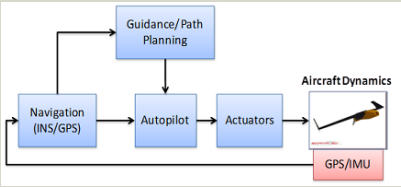
December 2015: Closed out

Closeout Summary: Onboard Model Checking for Small Scale Unmanned Aerial Vehicle Autopilots, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image*(https://techport.nasa.gov/file/139310)*

Images



Briefing Chart Image
Onboard Model Checking for Small Scale Unmanned Aerial Vehicle Autopilots, Phase I
(https://techport.nasa.gov/image/128844)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Optimal Synthesis, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

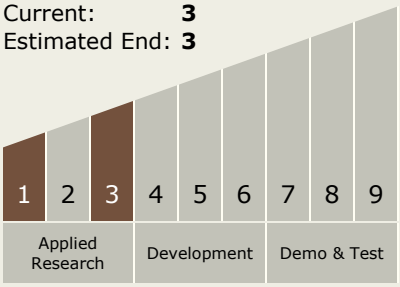
Carlos Torrez

Principal Investigator:

Bong-jun Yang

Technology Maturity (TRL)

Start: **1**
Current: **3**
Estimated End: **3**



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Completed Technology Project (2015 - 2015)

Technology Areas

Primary:

- TX16 Air Traffic Management and Range Tracking Systems
  - TX16.4 Architectures and Infrastructure

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System